

Inferential Statistics: Testing a Perceptual Phenomenon

1. **Identify the variables in the experiment:** The dependent variable is the amount of time recorded for the experiment while the independent variable is whether the variable is congruent (name of color matches with actual color) or incongruent (name of color does not match with actual color).
2. **What is an appropriate set of hypotheses for this task? What kind of statistical test do you expect to perform? Justify your choices.** The difference of time is the most important aspect of this hypothesis:

$$\mu_D = \mu_x - \mu_y$$

- μ_D represents the difference between the two population means
- μ_x represents the congruent mean population
- μ_y represents the incongruent mean population

$$H_0: \mu_D = 0$$

$$H_A: \mu_D \neq 0$$

The null hypothesis in this test (H_0) states that there is no difference in time between the two population means. The alternative hypothesis (H_A) proposes that the times between the two means are different from one another.

I chose to perform a dependent t-test because it met the qualifications of being a paired sample that had proof of two conditions and a pre test and post test. The sample data for this test is small ($n < 30$), which makes it more appropriate to use a t-test and it is great for “testing the mean of one population against a standard or comparing the means of two populations”.

3. **Report some descriptive statistics regarding this dataset. Include at least one measure of central tendency and at least one measure of variability.**

Distribution of congruent word times:

Sample Size = 24

Mean = 14.051125

Degrees of Freedom = 23

Standard Deviation = 3.55935796

SEM = .726550902

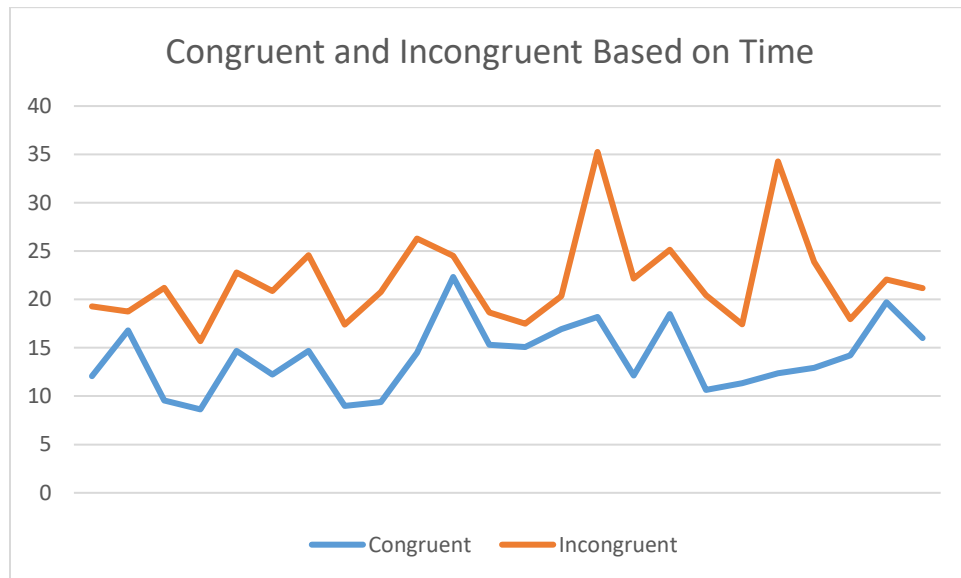
Distribution of incongruent word times

Sample Size = 24

Mean = 22.01591667

Degrees of Freedom = 23
Standard Deviation = 4.797057122
SEM = .979195185

4. Plot the data by showing one or two visualizations to show off data including comments on what can be observed in the plot or plots



This is a line chart compares the two variables, congruent and incongruent, against each other based on time. According to the graph, incongruent time data have longer times to be identified when compared to congruent time data. The max incongruent entry is 35.255 while the max congruent entry is 22.328.

5. Perform a statistical test which includes a test statistic, p-value, and test result

Degrees of Freedom = 23
Confidence Interval = 95%
 $\alpha = 0.05$
t-critical = +/- 2.069
Mean = $14.051125 - 22.01591667 = -7.96$
Standard Deviation = 4.8648269
SEM = .993
t-statistic = 8.016 or 8.02
With a t-statistic of 8.02, the p-value is $< .00001$. This means that the difference in means for congruent and incongruent times are very significant.

Since the p-value is less than alpha, we reject the null hypothesis that states that there is no difference in time between the two population means. Regardless of this t-test, there is blatant statistical proof that the two test are completely different in terms of completion time.

In conclusion, people on average do not take similar times to read the congruent and incongruent words. I completed the congruent words in 12.899 seconds and the incongruent words in 21.478 seconds.